

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
AIR AND RADIATION DIVISION
AIR TOXICS AND RADIATION BRANCH
RADIATION SECTION
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

Inspection Under the National Emission Standards for
Emissions of Radionuclides Other Than Radon
From Department of Energy Facilities

I. FACILITY IDENTIFICATION

A. Facility Location

Portsmouth Gaseous Diffusion Plant
United States Department of Energy Portsmouth Site Office
Post Office Box 700
Piketon, Ohio 45661

B. Responsible Official

Eugene W. Gillespie, Site Manager
Phone: (614) 897-5010

II. DATE OF INSPECTION

July 11, through July 15, 1994

III. PARTICIPANTS

A. Facility

Melda Rafferty, USDOE/PORTS; Jeri L. Elder, R&R/USDOE; Richard Meehan, USDOE/PORTS; Robert Blythe, MMES; Tony Saraceno, MMES; William Short, MMES; Larry Zonner, MMES; Clyde Dulin, MMES; Mary Kirker, MMES; Mary Beth Hamel, MMES; Michael Eversole, MMES; W. E. Landrum, MMES; T. L. Olin, MMES; Dean Roberts, MMES; Kenneth Tomka, MMES; Bryan Corbin, MMES; Doug Scott, MMES; Jason Patrick, MMES; Carol Van Meter, MMES.

B. USEPA

Michael H. Murphy, Region 5; Larry Jensen, Region 5

IV. ACROMYMS AND ABBREVIATIONS USED IN THIS REPORT

ANSI American National Standards Institute

APC Air Pollution Control

BE	Building exhaust
CFR	Code of Federal Regulations
cpm	Counts per minute
DAPC	Daton Air Pollution Control
DMR	Discharge Monitoring Report
DQO	Data Quality Objective
EML	Environmental Measurements Laboratory
EMSL-LV	Environmental Monitoring Systems Laboratory at Las Vegas
g	Grams
Ge(Li)	Germanium Lithium detection probe
HASA	High Assay Sampling Area
KeV	Kilo electron volts (1000 electron volts)
μm	Micrometer, Micron (0.000001 meter)
MDL	Minimum detection Limit
MMES	Martin Marietta Energy Systems
MMUS	Martin Marietta Utility Systems
N/A	Not Applicable or Not Available
NAREL	National Air and Radiation Environmental Laboratory
NESHAP	National Emission Standard for Hazardous Air Pollutants
NOAA	National Oceanographic and Atmospheric Administration
PAT	Proficiency Analysis Testing Program
PET	Proficiency Environmental Testing Program
PORTS	Portsmouth Gaseous Diffusion Plant

QA	Quality Assurance
QAPjP	Quality Assurance Project Plan
QC	Quality Control
SC&A	Sanford Cohen and Associates
USDOE	United States Department of Energy
USEC	United States Enrichment Corporation
USEPA	United States Environmental Protection Agency
WP	Water Pollution Performance Evaluation Study

V. OBJECTIVE/SCOPE OF INSPECTION

The objective of this inspection is to provide a follow up to the baseline evaluation for the radionuclide NESHAP, 40 CFR 61, Subpart H. The inspection is intended to gather data to ascertain whether the Portsmouth Gaseous Diffusion Plant is meeting the Findings of the previous Inspection on the agreed schedule to come into compliance with all requirements of the regulation, and if not, which areas of the facility are out of compliance. The data gathered will support the USEPA case for development of a Federal Facility Compliance Agreement with USDOE, if necessary, to come into compliance with this regulation in a timely manner.

The scope of the inspection is to 1) perform a limited walk-through survey to observe all of the locations that are or are suspected of being emission points on site to determine compliance with the monitoring requirements of the regulation, and 2) examine documents on dose modelling and other recordkeeping requirements of the regulation to determine compliance.

VI. FACILITY DESCRIPTION

This facility description is taken from the United States Department of Energy (USDOE) Air Emissions Annual Report submitted to meet the requirements of 40 CFR 61.94, in Subpart H, for the Calendar Year 1991.

The Portsmouth Gaseous Diffusion Plant (PORTS) is owned by the Department of Energy and is managed by Martin Marietta Energy Systems, Inc. (MMES). The facility is located in a sparsely populated rural Pike County,

Ohio, on a 16.2 km² (6.3 mile²) site about 1.6 km (1 mile) east of the Scioto River Valley at an elevation approximately 36.6 m (120 ft) above the Scioto River floodplain. The terrain surrounding the plant, except for the Scioto River floodplain, consists of marginal farmland and densely forested hills. The Scioto River floodplain is farmed extensively, particularly with grain crops.

Pike County has a generally moderate climate. Winters in Pike County are moderately cold and summers are moderately warm and humid. The precipitation is usually well distributed with fall being the driest season. Prevailing winds at the site are out of the southwest to south. Average wind speeds are about 5 mph (8 km/h), although winds of up to 75 mph (120 km/h) have been recorded at the plant site. Usually, high winds at the site are associated with thunderstorms that occur in the spring and summer. Southern Ohio is within the midwestern tornado belt although no tornados have struck the plant site to date.

Pike County has approximately 23,000 residents. Scattered rural development is typical; however, the county contains numerous small villages such as Piketon, Wakefield, and Jasper, which lie within a few kilometers of the plant. The county's largest community, Waverly, is about 19 km (12 miles) north of the plant site and has a population of approximately 5100 residents. Additional population centers within 80 km (50 miles) of the plant are Portsmouth (population 25,500), Chillicothe (population 23,420), and Jackson (population 6675). The total population of the area lying within an 80 km (50 mile) radius of the plant is approximately 600,000.

The principal site process is the separation of uranium isotopes through gaseous diffusion. Support operations include the feed and withdrawal of material from the primary process, treatment of water for both potable and cooling purposes, steam generation for heating purposes, decontamination of equipment removed from the process for maintenance or replacement, recovery of uranium from various waste materials, and treatment of industrial wastes generated onsite.

VII. INSPECTION FINDINGS

GENERAL FINDINGS

The main points that are addressed regard the meeting of the Findings of the Baseline Inspection, a more in depth review of the records regarding possible radionuclide emissions, and implementation of the Quality Assurance measures specified by MMES/USDOE-MMUS/USEC in the QA/QC document(s) for this site.

For the sample station locations that were inspected, the sampling point and

sample collection traps were located in very close proximity to each other. This greatly reduces the probability of losses of material in the lines. Additionally these lines are acid rinsed annually and the rinsate is analyzed and added to the total sample results for that sample location. However, these short sample lines did have 90 and 180 degree bends that could have been better minimized. It was indicated that these bends were to be reduced in number or eliminated as the sampling collection systems were updated.

It is clear that PORTS has been working toward meeting the requirements of 40 CFR 61, Subpart H, from the submittal of a proposed Compliance Plan received by Region 5 on September 3, 1992. Many of the potential areas of concern have been addressed prior to this inspection. Additionally, The proposed schedule for meeting the Inspection Findings from the 1993 Inspection is currently being met or is slightly ahead of schedule.

There is a concern regarding the apparent lack of "backup" personnel to perform specific tasks if the principal personnel are not available. This particular point is being addressed by more personnel being cross-trained in some areas. This will help provide a team depth, but additional staffing may still be necessary to adequately meet this need.

SPECIFIC FINDINGS

Stack-Sampling Line Losses

Though sampling lines are kept to short lengths, generally one meter or less, the number of bends in these lines have not been kept to a minimum as is cited in ANSI N13.1.

Losses due to sampling-line deposition must be considered in computing annual stack releases. Losses on sampling lines may occur due to gravitational deposition, brownian diffusion, and turbulent-flow deposition. The fraction of particulates in the effluent stream that deposits by these processes will depend upon such parameters as flow velocity, particle size, particle density, length of sampling line, etc. In addition, losses will occur at bends in the sampling line. ANSI N13.1 recommends making sampling lines as short and with the fewest bends as possible.

The amount of material that deposits in sampling lines can be estimated by solving appropriate equations (AN91, ANSI69), or they may be determined by removing the sampling line, rinsing the deposited material from the line with an acid solution, and analyzing the solution for the appropriate constituents. The quantities determined by either method should be added to the annual discharge from the stack. The latter method is used at PORTS for determining sampling line losses, which is much more accurate than the computational

method.

The sampling lines on the PORTS stack samplers are, in general, short (1 meter or less) and include 2 or 3 bends, which in some cases seem unnecessary. A bend of 180° is extreme and probably should be avoided if at all possible. It should be pointed out, however, that the 180° bends are formed in wide arcs which probably minimizes the losses in those bends.

Isokinetic Stack Sampling

The sampling being conducted in the airborne effluent stream is very close to the isokinetic sampling requirement for particulates with correction factors in the range of 1.06 to 0.96.

Non-representative sampling (anisokinetic sampling) results from the failure to withdraw a sample from a flowing stream at the same velocity that exists locally in the stream. If sampling occurs at a much lower velocity, larger particles will be impacted into the collecting probe, whereas at much higher sampling rates, a greater fraction of smaller particles will be drawn into the probe.

The Portsmouth Gaseous Diffusion Plant Quality Assurance Project Plan-Draft (POEF-3578, June 1992) (QAPjP) defines a measure of isokinetic sampling as follows:

$$\%Iso = \left[\frac{(\text{Avg. Nozzle Velocity})}{(\text{Avg. Gas Velocity})} \right] \times 100,$$

where

%Iso	=	percent of sample probe nozzle gas velocity compared to the effluent stack gas velocity;
Avg. Nozzle Velocity	=	Average gas velocity in sample probe nozzle;
Avg. Gas Velocity	=	Average velocity of the effluent stack gas.

During the inspection of the continuous vent stack samplers in Building X-336, Mr. Larry Zonner indicated that stack-sampler flow rates are generally maintained between 80 to 90 percent of maximum, and isokinetic sampling occurs at 85 percent of maximum. During this inspection, stack sampler flows for samplers 5, 6 and 7 ranged from 87 to 91 percent of maximum, which is quite close to what is considered isokinetic sampling. Corrections for

anisokinetic sampling are relatively small. For example, ANSI reports that the corrections for 4 μ m particles when the sampling velocities are 0.5 and 1.5 times the stream velocities are only 1.06 and 0.96, respectively (ANSI69). Thus, it would appear that the PORTS samplers are operated sufficiently near to isokinetic conditions that no corrections are required.

An91 N.K. Anand and A.R. McFarland, "Deposition: Software to Calculate Particle Penetration Through Aerosol Transport Line - Draft Report," Department of Mechanical Engineering, Texas A&M University, Prepared for the U.S. Nuclear Regulatory Commission, NUREG/GR-0006, 1991.

ANSI69 American National Standards Institute, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," ANSI N13.1, 1969.

Radiochemistry Procedures

The radiochemistry procedures are closely monitored and any procedural changes are documented in a controlled manner.

Billy Short, Tony Saraceno, and Debbie Perez (building X-710) were interviewed briefly concerning the radiochemical procedures for uranium-238, uranium-235, and technetium-99. These procedures are described in:

- 1) "Analysis Of Alumina Traps From Continuous Vent Monitor For U, U-235, and Tc", TSD-553-359, Rev. 1, January 1, 1987; last record of change, May 21, 1992.
- 2) "Operating Instructions for Fluorophotometer Q5198A", TSD-551-106-1, August 6, 1990; Revised date, February 15, 1991.

In general, uranium-238 is determined by fluorometry, uranium-235 is determined by measuring the 185.7 KeV photo peak using a Ge(Li) detector, and technetium-99 is measured by liquid scintillation counting following

purification by solvent extraction.

From this short interview and with a review of the written procedures, it appeared that the procedures being used are adequate and are being closely followed by the chemists conducting the analyses. Procedural changes are controlled and the process for affecting a change is closely monitored and documented.

Quality Assurance for X-710

The Quality Assurance program appears to meet the necessary objectives of the rule, within the constraints of the inspection.

Time constraints permitted the review of only a few elements of the X-710 Laboratory's Quality Assurance/Quality Control (QA/QC) program. These elements were reviewed with Ms. Carol Van Meter and included the laboratories cross-check analyses program, qualifications of analytical personnel, data quality objectives (DQOs), and nonconformance/corrective action reporting and follow-up.

During the follow up inspection, it was evident that considerable work had been completed to better document all data that was generated. This includes a superior documentation on any data corrections that are made and the justifications for them.

During 1992, PORTS participated in 6 external cross-check analyses programs, which is a more extensive program than at most analytical laboratories. The programs were the Proficiency Environmental Testing Program (PET), Environmental Monitoring Systems Laboratory at Las Vegas (EMSL-LV), Environmental Measurements Laboratory (EML), Discharge Monitoring Report Quality Assurance Study (DMR-QA), Proficiency Analytical Testing Program (PAT), and the Water Pollution Performance Evaluation Study (WP).

Meteorological Monitoring System

In the past, the meteorological monitoring system has been out of calibration for a significant amount of time, making all of the data calculated with the noncalibrated data suspect and unable to necessarily establish the compliance status of the facility.

Currently, the meteorological monitoring system has been upgraded to more than meet the requirements of the models used in the CAP-88 PC program. There are three sets of instruments for each of two measuring heights, 10 meters and 40 meters. The 40 meter data is used for the CAP-88 PC program runs. The new instrumentation is tied into the meteorological computers via communication link and has a data logging capability for at least one full week for all data. This data can be "dumped" into a portable computer upon command, so that there should be virtually 100 percent data capture.

The new meteorological tower was erected and the instrument packages were available on site, three sets for each of three measurement locations, but not placed yet due to contractor difficulties. The new tower will gather data at 10 meters, 40 meters, and 60 meters. The instrumentation is virtually identical to the current instrumentation being used for the necessary meteorological data.

The previous meteorological monitoring system was a single meteorological tower (X-120) located south of XT-801, equipped with instrument packages at the 10- and 40-meter levels. Air temperature, wind speed, and direction are measured at both levels. In addition, there is ground level instrumentation for measuring solar radiation, barometric pressure, and precipitation. There were two complete sets of instruments, the second set serving as a backup to the active set; every 6 months the active set was replaced by the backup set and sent to the vendor for calibration. On July 11, 1990, lightning struck the meteorological tower and burned out all of the instruments; an instrument set had just been removed and packaged for shipment to the vendor when the lightning strike occurred. These packaged instruments were then immediately retrieved and put back into service on the tower. Therefore, the meteorological monitoring system's instruments have not been calibrated since July 11, 1990. Common practice, such as stated in USEPA's On-Site

Meteorological Program Guidance for Regulatory Modeling Applications, is that the meteorological system should be calibrated every six months.

In October of 1990, a portable meteorological tower was borrowed from the National Oceanographic and Atmospheric Administration (NOAA), with these instruments being permanently mounted on the PORTS tower adjacent to the PORTS instrumentation in late 1991. The NOAA meteorological data format is not compatible with the existing PORTS data processing system, is not used for compliance monitoring, but is used as a means of verifying data from the PORTS instrument set. Also, a project is currently in place to completely upgrade the present meteorological system with new instruments and add six additional monitoring towers; the additional towers are intended to support activities at the site's Emergency Operations Center. This new meteorological system is expected to provide data necessary for NESHAP, Subpart H Compliance modelling.